AD#-160

PATENT

HARMONIC STABILIZER SYSTEM FOR RIFLE BARREL AND A RIFLE EQUIPPED THEREWITH

Background and Summary of the Invention

The present invention is directed to a device for improving accuracy of a rifle. More particularly, the present invention is directed to a harmonic stabilizer system for reducing vibration of a rifle barrel, thereby, reducing scatter, and to a rifle equipped with such a system.

Whether target shooting or hunting, a rifleman wants consistent, accurate shot placement; i.e., she/he wants to hit that at which she/he is shooting. A variety of factors can influence accuracy including windage, fatigue, ability, and harmonic vibration. The rifleman has no control over a number of these factors. It is the purpose of this invention to remove harmonic vibration from the group of factors which are not controllable. A number of attempts have been made to cope with this problem including hanging weights on the end of the barrel and employing an energy storage device. These attempts have met with only limited success and, in that they are typically bulky, generally, negatively contribute to the fatigue factor.

It has been determined that by installing a spring means between the barrel and the stock, a particular rifle using a particular bullet can be tuned to its "sweet spot" significantly reducing shot scatter problems caused by harmonic vibration. The present invention comprises a harmonic stabilizer system for a rifle barrel including spring means having a first end attached to a section of a stock ahead of a recoil lug; adjustment means engaging said spring means to adjust a level of stabilization force applied by a second end of said spring means against the rifle barrel; whereby said stabilizer system can be tuned for a particular rifle and bullet combination to greatly reduce shot scatter introduced by vibration of the rifle barrel during firing.

In one embodiment, a coil spring is used. In the preferred embodiment, a contoured leaf spring is employed and an adjustable screw mounted in the stock is used to adjustably increase the

level of stabilization force applied against the barrel. While the leaf spring may be made of a number of materials (including plastic), it is preferably made of spring steel having a thickness of between .018 and .024 inches. Spacers can be mounted in the stock to provide thread engagement for both the attachment and adjustment screws. The spring is preferably contoured into a curved shape which has a reverse camber adjacent its free end to enhance the surface area engagement with the barrel. The engagement end can be fitted with a pad to interface between the spring and the barrel, the pad being made of a material selected from the group consisting of NAVCOM, another elastomer, and shrink tubing. While it is possible that the spring may be positioned anywhere between the recoil lug and the forward end of the stock, it is believed that the optimum location is toward the trailing end of the barrel where there will be less influence from thermal expansion.

Various other features, advantages and characteristics of the present invention will become apparent to one of ordinary skill in the art after a reading of the following specification.

Brief Description of the Drawings

The preferred embodiment(s) of the present invention is/are described in conjunction with the associated drawings in which like features are indicated with like reference numerals and in which

Fig. 1A is a side view of a first embodiment of the harmonic stabilizer of the present invention mounted on a rifle;

Fig. 1B is a side view of a second embodiment mounted in operative position;

Fig. 1C is a side view of a third embodiment mounted in operative position;

Fig. 2 is a side view of a fourth embodiment mounted in operative position;

Fig. 3A is a diagram showing the original scatter pattern for one weapon;

Fig. 3B is a diagram showing the scatter pattern for a rifle equipped with the harmonic stabilizer of the present invention tuned to its sweet spot;

Fig. 4A is a diagram showing the scatter pattern for a second undamped rifle;

Fig. 4B is a diagram showing the scatter pattern for the second rifle tuned to its sweet spot;

Fig. 4C is a diagram showing the scatter pattern for the rifle providing additional spring force; and

Fig. 4D is a diagram showing the scatter pattern for the rifle with additional spring force.

Detailed Description of Preferred Embodiment(s)

A first embodiment of the harmonic stabilizer system of the present invention is shown in **Fig. 1A** generally at **20**. Harmonic stabilizer system **20** comprises spring means **22** positioned between the rifle barrel **11** and the stock **13** between the recoil lug **15** and the end of the stock **17**. While the spring means **22** can be made of a variety of materials including some high strength plastics, in this embodiment, spring means **22** preferably comprises a leaf spring manufactured of spring steel which has a thickness in the range between .018 and .024 inches. This spring thickness is appropriate for conventional sports rifles. Thinner spring stock could be used with thinner barrels.

A first end **24** of spring means **22** is secured to stock **13** by attachment screw **26**. Spring means **22** is contoured into an arcuate shape with a reverse camber tip portion on the second end **28** thereof to enlarge a size of a contact region with the rifle barrel **11**. Harmonic stabilizer system **20** further comprises adjustment means **32**, in this embodiment, a set screw, which abuts spring means **22** and adjusts the stabilizing force administered to the rifle barrel **11**. Access port **19** enables an Allen wrench, or the like, to be used to increase/decrease the force applied by spring means **22** to rifle barrel **11** by rotating screw **32** in threaded sleeve **34**. Locking screw **36** snugged up against adjustment screw **32** prevents undesired loosening of the adjustment. Shrink tubing **30** is attached to second end **28** of spring means **22** providing additional damping of vibration.

A 300 Winchester magnum equipped with the **Fig. 1A** embodiment was used to fire 180 grain Spitzer bullets available from Nosler, Inc. in the **Fig. 3A** and **3B** tests. No stabilizing force was applied in the **Fig. 3A** shoot, accounting for the fairly broad scatter pattern. Each of the weapons used in these tests were fired from a test stand in order to remove, as much as possible, the human factors from the mix. The shot patterns were obtained in each instance without allowing the barrels to cool between successive shots in order to simulate, as closely as possible, actual firing conditions. In **Fig. 3B**, spring means **22** was adjusted to near the "sweet spot", i.e., the system was close to being tuned to provide optimum performance with this load in this weapon.

A second embodiment of the harmonic stabilizer of the present invention is depicted in **Fig. 2B** generally at **20A**. In this second embodiment, the tip **28A** has a pad **30A** of NAVCOM material (this trademark is an acronym for noise and vibration control material which is made from a SORBOTHANE elastomer, and is available from Sims Vibration Laboratories) adhesively bonded thereto. This elastomeric material further damps the vibration of the rifle barrel **11A** caused by the explosion resulting from firing the weapon.

A 270 Winchester equipped with the **Fig. 1B** embodiment was tested firing 130 grain SST bullets available from Hornady Manufacturing. The results appear in **Figs. 4A-4D**. In **Fig. 4A**, no stabilizing pressure was applied to the barrel **11A**. In **Fig. 4B**, the rifle was tuned for this load and provided a very tight scatter pattern. The adjustment screw **32** was turned an additional 1/4 turn past the position shown in **Fig. 4B** to determine what difference additional force might make. As can be

seen in **Fig. 4C**, this application resulted in a destabilization of the harmonic damping which was achieved in **Fig. 4B**. As a cross check, an additional 1/4 turn was applied beyond the **Fig. 4C** adjustment to produce the **Fig. 4D** results. As **Fig. 4D** shows, applying this amount of excessive force produces substantially the same results as the original scatter pattern of the weapon/load combination in **Fig. 4A**. This demonstrates the critical importance of tuning; applying excessive force using the harmonic stabilizer system **20**A of the present invention will produce little, if any, beneficial results.

A third embodiment of the harmonic stabilizer system of the present invention is shown in **Fig. 1C** generally at **20C**. This embodiment is utilized with a synthetic stock **13C**. Attachment spacer **27C** is used to receive attachment screw **26C** and to provide a reaction surface for first end **24C** of spring **22C**. Adjustment spacer **34C** receives adjustment screw **32C** and locking screw **36C**.

A fourth embodiment of the harmonic stabilizer system of the present invention is shown in **Fig. 2** generally at **20D**. In this embodiment spring means **22D** comprises a coil spring with a cap **21D** and adjustment means is, once again, a set screw **32D**. While a coil spring will work, it limits the placement of the spring means since the device including the attachment is so linear. The length of the spring means 22D necessitates mounting on the portion of the stock thick enough to accommodate that length.

The harmonic stabilizer system **20** of the present invention permits the effects normally associated with the destabilizing created by the explosion of any particular bullet to be tuned out of the equation so that the scatter pattern for that combination of weapon and load can be tightened significantly improving accuracy. Harmonic stabilizer system **20** can be retrofit to existing weapons or included in OEM rifles.

Various changes, alternatives and modifications will become apparent to one of ordinary skill in the art following a reading of the foregoing specification. For example, by carving an oversized hole in the leaf spring, the apparatus of the present invention can be used with a muzzle-loaded rifle, the hole accommodating the ram rod in its stored position. It is intended that any such changes, alternatives and modifications as fall within the scope of the appended claims be considered part of the present invention.